Baiting and Feeding

Background.

Deer baiting is the deliberate placement of food for the purpose of attracting or habituating deer to a location for hunting. Deer feeding activity includes recreational, supplemental, and emergency feeding. Feeding does not include the placement of food and attractants for the purpose of hunting deer. Recreational feeding is done mainly for viewing deer. Supplemental feeding normally involves placing larger quantities of food or mineral to augment naturally occurring foods. The purpose may be to attract, concentrate, and hold deer on specific parcels of land or to increase local antler development and carrying capacity for deer. Emergency feeding is the deliberate placement of food during unusually severe winters, mainly to mitigate winter losses of deer. References to feeding in this document refer to all forms of feeding unless specified otherwise.

Baiting of deer for hunting had been legal in Wisconsin until 2002. But, historic prohibitions on using bait for waterfowl and use of salt for attracting deer may have fostered widespread belief that baiting of deer was illegal. Despite this, low levels of baiting existed in northern areas that had very low deer densities. Growing awareness that baiting was legal led to a rather sudden and widespread increase in baiting during the 1980s and 1990s. Prior to the discovery of CWD in Wisconsin, feeding of deer by the public had not been regulated in the state. Some rural resorts, restaurants, taverns, and residents have had a long tradition of putting food outside of windows to provide opportunities for close viewing of deer. The proportion of Wisconsin's rural residents that feed deer is unknown. Renewed concern for disease transmission in the upper Midwest requires re-examination of deer baiting and feeding.

The cumulative amount of artificial energy provided through public feeding and baiting has not been quantified in Wisconsin. However, studies in Michigan (Winterstein 1992) and testimony in Wisconsin (Bob Ohlson, WICORN, Racine, NRB meeting, August 2002) suggest that the energy impact could be significant. A questionnaire survey of landowners (greater than 10 acres) in southern Michigan found that nearly one in five provided some form of feed for deer (Nelson and Schomaker 1996). There is no reason to assume a smaller proportion of rural residents feed deer in Wisconsin. Over 450,000 bushels of bait were estimated to have been used in northern Wisconsin during the 2001 deer seasons, based on the number of Wisconsin archery and gun hunters who used bait (Wisconsin DNR 2002). This equates to approximately eight bushels of bait used per northern deer hunter that baited in 2001. However, this may be a minimum estimate (see Appendix K).

Baiting and feeding deer artificially concentrates deer and their activity (Garner 2001). This facilitates both increased animal-to-animal contact and exposure to potentially disease contaminated sites (Garner 2001). A consequence of increased contacts is an increased risk of transmission of infectious disease among deer (McCarty and Miller 1998, Gross and Miller 2001). This concern is heightened by the recent discovery of CWD in Wisconsin's wild deer herd. Baiting and feeding of deer have become increasingly popular throughout the state, but must be considered a risk factor in disease transmission (Schmitt *et al.* 1997, Garner 2001, Obrien *et al.* 2002, Williams *et al.* 2002a).

Researchers who have studied CWD epidemics in both captive and free-ranging deer populations have determined that CWD is both contagious and self-sustaining (meaning that new infections occur fast enough for CWD to persist or increase over time despite the more rapid deaths of the diseased individuals; Miller *et al.* 1998, 2000). Supporting evidence comes from observational data (Williams and Young 1992; Miller *et al.* 1998, 2000) experimental data, and epidemiological models fit to observed prevalences in free-living deer (Miller *et al.* 2000, Gross and Miller 2001, M. W. Miller unpubl.cited in Williams *et al.* 2002a).

Recent discovery of TB in free-ranging deer in Michigan and CWD in Wisconsin has refocused discussions about baiting and feeding of deer. Specific research on the health effects of baiting and feeding is limited because baiting of deer is illegal in most states (Marshall 1999). Baiting and feeding are variably practiced in different states, and until recently, they have not been widely viewed as management issues (Dawson 1988). However, current ongoing studies in Michigan (Garner 2001) and elsewhere indicate that density and congregation of animals caused by baiting and feeding increase disease transmission. The national

CWD disease management workgroup recommended the cessation of feeding and baiting of deer as a control strategy for containing and eradicating CWD (National CWD Plan Implementation Committee 2002).

Experimental and epidemiologic evidence suggests infected deer and elk may transmit CWD through animal-to-animal contact or contamination of food or water sources with saliva, urine, or feces (Williams *et al.* 2002a, Williams and Young 1980, Miller, *et al.* 1998, Sigurdson *et al.* 1999). The World Health Organization (WHO) concluded that the epidemic dynamics of CWD most closely resemble those of scrapie in sheep, another TSE where transmission between animals through close contact is important (WHO 1999). The highest CWD infection rates documented (20%-90%) occurred in captive cervid populations housed in farm or research settings (Williams *et al.* 2002a). However, CWD prevalence of 15%-20% has also been found in wild deer populations in Colorado, specifically in dense populations associated with artificial (illegal) feeding (M. Miller, pers.comm.). Consequently, CWD researchers conclude that prohibiting feeding and baiting of deer and elk should be included in strategies to prevent, control, and eradicate CWD (Gross and Miller 2001). Disease modeling and recommendations from the National CWD Management Plan suggest that measures to reduce transmission rates are important in reducing disease persistence and spread (McCarty and Miller 1998, Gross and Miller 2001, Miller *et al.* 2000).

Reduction of contact through a ban on baiting and feeding is very important to eradicating or containing a CWD outbreak**.** Epidemiological models fit to real-world data on CWD outbreaks in mule deer predict that local extinction of infected deer populations is likely (Gross and Miller 2001). The predicted outcomes of these models are highly sensitive to the amount of contact between infected and susceptible deer. This means that small reductions in contact rates can dramatically reduce the rate at which prevalence changes during an epidemic (Gross and Miller 2001). Garner (2001) demonstrated that baiting and feeding was associated with deer concentration, extensive face-to-face contacts, and increasing overlap of deer home ranges. White-tailed deer have social contacts apart from contact over baiting and feeding sites (Marchinton and Hirth 1984), but social groups tend to be small relative to other deer species and both their physiology and behavior are adapted to selective foraging on nutritious plants (Putman 1988). Moreover, social groups tend to exclude one another (Mathews 1989), thus eliminating the additional direct and indirect contact that occur between groups using baiting and feeding sites (Garner 2001) eliminates a large amount of group-to-group contact that would otherwise occur.

Eliminating these contacts has added significance because CWD is a uniquely difficult disease to manage. There is no treatment and no vaccine. Moreover, CWD is difficult to track in a population because of long incubation periods, subtle early clinical sign, a resistant infectious agent, potential for environmental contamination, and incomplete understanding of transmission mechanisms. These characteristics make prevention critically important (Williams *et al.* 2002a). Hence, an international panel reviewing CWD management in Colorado emphasized that, “Regulations preventing… feeding and baiting of cervids should be continued” (Peterson *et al.* 2002).

Discovery of CWD in Wisconsin’s free-ranging deer in late February 2002 has intensified a debate about how deer baiting and feeding may increase risk of infectious disease establishment and transmission in Wisconsin’s deer population. CWD is both transmissible and infectious and the infectious agent may be shed through the alimentary tract (SCWDS 2002). “Residual environmental contamination (as might be deposited by feces or saliva) also appears to be important in sustaining epidemics” (Williams *et al.* 2002a). Oral transmission of CWD was demonstrated when mule-deer fawns were fed contaminated material (Sigurdson *et al.* 1999). “Concentrating deer and elk in captivity or by artificial feeding probably increases the likelihood of direct and indirect transmission” (Williams *et al.* 2002a, SCWDS 2002). The highest prevalence rates of CWD in Colorado have been found in wild and captive situations where deer densities were high and there was frequent congregation over artificially provided food sources such as in dense populations (M. Miller, pers. comm.).

Though current concern is focused on managing deer baiting and feeding as part of the state’s efforts to eradicate CWD, it is important to remember that state-wide baiting and feeding continue to put wild deer at higher risk for other serious diseases and parasites, such as anthrax, brucellosis, epizootic hemorrhagic disease (recently identified in southwestern Wisconsin), vesicular stomatitis, leptospirosis, listeriosis,

bovine tuberculosis, tularemia, anaplasmosis, and brain worm (Hurley 1995). Johne's disease also is considered by many veterinarians as rather endemic among domestic cattle and is known to be infectious and fatal to deer.

Any of these diseases, all of which have been found in free-ranging white-tailed deer in North America, could be spread more readily in situations where deer are artificially concentrated and deer-to-deer contacts, as well as contact with urine, feces, and saliva are increased (Hurley 1995). Deer may also be poisoned by biotoxins such as aflatoxin, commonly found in grains sold as wildlife food (Schweitzer *et al.* 2001).

For additional information regarding baiting and feeding and disease transmission see Appendix J.

Proposed Action.

The proposed rule would prohibit baiting and feeding of deer statewide to reduce the chance that disease would become established and spread in local deer herds. This rule would not prohibit bird and small mammal feeding where the feed is inaccessible to deer. The rule would also continue to allow feeding of wildlife by people attending the feed so long as they removed the feed when they left the site. Gravity feeders and devices that are designed to broadcast feed to the ground would be prohibited when accessible by deer. Foods produced as a result of normal agricultural or forestry practices, standing crops, food plots, and natural vegetation would not be considered bait in the proposed regulation.

Past analysis of deer baiting and feeding by the Wisconsin Conservation Congress *Deer Management for 2000 and Beyond* project and special Natural Resources Board Committee on Baiting and Feeding have separated the two issues due to social differences. However, biologically and from a disease control aspect, baiting and feeding are not separate issues. Both practices artificially concentrate deer by repeatedly providing food for consumption to a location thereby likely increasing the risk of disease transmission. Therefore, for the purpose of this analysis these two activities have not been separated.

An exemption would be granted for baiting bear if bait is placed such that the bait is not available to deer. Bear baiting is one of two techniques available to bear hunters. The elimination of bear baiting would greatly reduce the effectiveness of bear hunters and would impair control of the bear population in Wisconsin. Strict regulations on placement of bear baits eliminates much of the concern about deer accessing these baits and reduces risk of transmission of CWD among deer.

Permits to authorize limited site-specific baiting would be allowed to facilitate trapping or removing nuisance wild animals, including deer and geese in urban, park, or airport situations. There may be other non-hunting purposes where baiting might be authorized such as when capturing research animals or removing potentially diseased animals.

It should be noted that prohibiting baiting and feeding is part of a comprehensive strategy, not a stand-alone solution to controlling CWD.

Effects.

A ban on baiting and feeding could have both ecological and socio-economic effects. Ecologically there could be reduction of disease transmission rates, smaller deer populations, and secondary environment effects. Socio-economically there could be effects on businesses that sell deer feed, public safety, tourism, license sales, and hunter satisfaction.

Deer Population.

An elimination of deer baiting and feeding may reduce the deer herd by making deer survive the winter on naturally available food. In some cases, baiting and feeding appear to enable the environment to support more deer throughout the year than might otherwise be possible. This "artificial" energy is believed to affect natural processes including winter mortality (Baker and Hobbs 1985) which is part of the natural process for deer living close to the northern limit of their range. Placement of feed may alter natural

movements and timing of yarding by deer (Ozoga and Verme 1982, Lewis 1990, Garner 2001). In the absence of baiting and feeding, deer populations may respond to natural processes of productivity and survival.

A prohibition on baiting and feeding may help restore deer populations to established goals but would not cause the deer population to crash. Goals in the forested regions reflect carrying capacity of the natural environment. The preferred method to achieve herd reductions is by hunter harvest. But, prohibition of feeding and baiting of deer may also help reduce the over-abundant northern deer population as the herd density responds to the natural carrying capacity of the land. Herd responses do not necessarily imply massive starvation. Subtle changes in productivity (*e.g.,* production of fewer fawns per year and reduced breeding among fawns) are likely to be long-term mechanisms, although periodic increases in malnutrition-related mortality could accompany severe winters. Throughout the southern two-thirds of Wisconsin, the nutritional availability for deer would not likely change in response to a baiting and feeding ban because of the high availability of agricultural food.

Another effect of the proposed ban may be an improvement in the DNR's ability to manage the state deer herd. Baiting and feeding of deer may have confounded the State's ability to maintain deer numbers at established population goals mandated by state law. Natural constraints of habitat and weather have played a role (along with prescribed antlerless harvests since 1964) in maintaining northern deer populations near established goals (McCaffery 1995). With the addition of food to the environment, natural constraints of habitat and weather may have been relaxed, allowing herds to grow to densities exceeding natural carrying capacity and hunter demand for harvest. Thus, deer populations have rather consistently exceeded goals since 1987. Despite very liberal hunting regulations, the statewide post-hunt deer population in 2001 was 32% above goal and in the northern forest the population was 40% above goal (Rolley 2002). Baiting and feeding may also change deer behavior and distribution impairing hunter ability to harvest deer. Deer populations may orient towards artificial food sources found in residential clusters and on private lands, where access is restricted or firearm discharge is unwelcome. A prohibition of baiting and feeding would be expected to allow deer behavior and distribution to respond to natural processes, potentially improving harvest opportunity. In addition, deer productivity and survival would likely respond to the natural environmental influences, allowing northern herds to be more effectively managed at established population levels.

A concern associated with the proposed ban on baiting and feeding is a potential reduction in the efficiency of hunters to harvest deer, resulting in a lower deer harvest. Studies to date have suggested small and inconsistent differences in success between hunters that use bait and those that do not. Langenau *et al.* (1985) found that Michigan hunters that used bait were only slightly more efficient in harvesting deer (2.4 deer/100 days for bait users vs. 2.2 for non-bait users). Winterstein (1992) also surveyed Michigan deer hunters and reported on the relative efficiency of bait users versus non-bait users. In general, bait users killed more deer per 100 hours of hunting in each of four seasons: early archery, late archery, firearm, and muzzleloader. In total, 3.8 deer were killed per 100 hours over bait versus 3.1 killed without bait. However, non-bait users spent more hours in the field. Thus, the overall success rate with bait was only marginally better for Michigan bait users. In contrast, Petchenik (1994) found that non-bait users in Wisconsin had higher success while gun hunting than bait users, but that archers using bait experienced "slightly higher" success rates than non-bait users. A more recent Michigan study by Frawley (2002) found similar results. Archers using bait took fewer days to harvest a deer than non-bait users but for gun hunters the improvement in efficiency was "relatively small." Individual success rates appeared significantly higher for archers that used bait.

An analysis using Wisconsin data suggests that a prohibition on baiting may not significantly affect firearm harvest of antlerless deer, but might depress archery harvest. However, the effect on total antlerless harvest would likely be small. If there were no compensatory increase in firearm harvest as a result of a reduced archery harvest, the net effect on total harvest could be about 4% in northern Wisconsin (Wisconsin DNR 2002).

It is unclear whether bait users may discontinue hunting if the method is prohibited. Frawley (2002) found that some hunters would hunt fewer hours or, in the case in Michigan, move their hunt to a county without a prohibition on baiting. He did not report that bait-hunters would quit hunting deer. Experience suggests that, all else being equal, the reasons harvests might stay the same in the absence of baiting is because:

1) hunters may be more likely to move about and thereby cause deer to move; 2) deer may be less likely attracted and held on private lands where they are inaccessible to other hunters; and 3) deer may resume normal foraging behavior that could increase their movement during daylight hours (Garner 2001). There is evidence that artificial provision of foods through baiting causes deer to become more nocturnal in their behavior (Ozoga and Verme 1982, Wegner 1993), confounding harvest opportunity by hunters.

During the 2002 Wisconsin deer seasons, there was a 19% reduction in the number of archery licenses and a 10% decrease in gun deer licenses sold from 2001 license sales. In addition, the preliminary analysis of the deer harvest data shows a 36% reduction in the archery harvest and a 13% reduction in the deer gun harvest. Until data from the 2002 CWD deer hunter survey are analyzed (Petchenik, in prep.), it is not certain whether this reduction was due in part to the elimination of baiting as a hunting method or whether concerns about CWD were the factors limiting participation and harvest.

Disease Control.

A ban on deer baiting and feeding would likely reduce risk of transmitting CWD and other diseases in Wisconsin's deer population. A primary biological consideration of baiting and feeding deer is the increased potential for disease transmission whenever animals are concentrated (Leopold 1933). Spread of disease relates directly to deer density, stress, and animal contact (Davidson 1981). CWD is one of many disease risks associated with feeding and baiting. The proposed action is anticipated to reduce the transmission of CWD between healthy and infected deer by: 1) reducing close contact among individual deer; 2) eliminating potentially contaminated food sites; 3) reducing contact between discrete social groups of deer; and 4) reducing deer herd density.

Animal visitation and contact typical at baiting and feeding sites may exacerbate transmission of CWD if an outbreak occurs. Accumulation of the presumed CWD agent in gut-associated lymphoid tissue (*e.g.,* tonsil, Peyer's patches, and mesenteric lymph nodes; Sigurdson *et al.* 1999, Miller and Williams 2002, Spraker *et al.* 2002) suggests that shedding through the alimentary tract (feces and saliva) may occur. Oral transmission of CWD has been demonstrated for mule-deer fawns (Sigurdson *et al.* 1999). Transmission via contact between susceptible and infectious individuals probably requires exchange of bodily fluids rather than just transient exposure (Williams *et al.* 2002a). Concentrating deer and elk in captivity or by artificial feeding probably increases the likelihood of direct transmission between individuals. Studies by Garner (2001) and Kilpatrick and Stober (2002) indicate that the provision of food increases animal contact by focusing their activity.

Provision of artificial food sources may encourage unnatural congregation of animals, thereby increasing contact and enhancing the transmission of infectious agents (Barlow 1996). As part of the evaluation of the TB eradication process in Michigan, research was conducted to determine the effects of feeding and baiting on deer movement, migratory patterns, behavior, and disease transmission. Garner (2001) documented extensive overlap of the locations of a TB-infected deer and 15 other radio-collared deer home ranges surrounding a network of feeding stations at one of his study areas. Core areas of activity shifted toward bait sites (Kilpatrick and Stober 2002) causing likely overlap and the potential for deer-to-deer contact. Scientists, biologists, epidemiologists, and veterinarians who have studied this situation have concluded that the most logical explanation for the establishment of self-sustaining bovine TB in free-ranging Michigan deer was high deer densities and the focal concentration of deer caused by baiting and feeding (Schmitt *et al.* 1997, O'Brien *et al.* 2002).

Because TSE agents are extremely resistant in the environment (Brown and Gajdusek 1991)**,** transmission may be both direct and indirect. Repeated placement of bait and feed in the same locations may amplify these concerns as sites and food may become infected with CWD prions. Epidemiological analysis indicated that the prevalence of TB in Michigan deer declined by half when herds were reduced and bans and restrictions on baiting and feeding were implemented (O'Brien *et al.* 2002).

Supplemental feeding may raise deer populations above levels that the natural environment will support (Ozoga and Verme 1982). Very high prevalence (50%-90%) of CWD in some captive facilities suggests that transmission of CWD may be positively density dependent. Questions remain, however, about the mechanism of CWD transmission. Research is currently being conducted in Colorado to test the relationship between population density and CWD prevalence. An elimination of deer baiting and feeding

may reduce deer population density and restore the balance between the deer population and the natural availability of food in the north. A deer herd within the carry capacity of the land should have adequate natural food resources, with less stress and competition for food, and should be less susceptible to starvation in winter and disease.

Another hypothesis is that feeding is beneficial as it tends to keep deer dispersed in winter and deters concentration of deer in yard situations in the north. Artificial feeding does tend to interfere with the natural process of yarding, and to the extent it does, it is undesirable (Ozoga and Verme 1982). A ban on baiting and feeding may allow deer to return to natural yarding behaviors in severe winters in northern Wisconsin. Disease transmission risks in deer yards are likely less than at artificial feeding sites because foraging behavior under natural conditions is fundamentally different than when deer are supplementally fed.

In deer yards, deer eat a variety of woody browse plants and arboreal lichens (Blouch 1984) scattered across a large area. In terms of biomass and nutrition, the best source of browse and lichens may be litter-fall rather than live plant material growing in the understory (Ditchkof and Servello 1998). The spatial distribution of understory plants and litter-fall is dramatically different from that of a feeding station. In a deer yard, deer may be concentrated (compared to summer distribution) but the potential for face to face contact over food or the consumption of food contaminated by feces and saliva is minimal. Food sources in yards (litter and understory plants) are widely distributed over a large area and they are not replaced. Moreover, browse is typically held aloft on the plant stem such that fecal contamination is less likely. Foraging of wintering deer is probably an optimization process. Gains associated with eating need to be balanced against energy costs associated with travel and exposure (Moen 1976). The fact that yarded deer with little or no access to supplemental food maintain relatively large overlapping home ranges (*e.g.,* 1700 – 4400 acres; Van Deelen *et al.* 1998) suggests that foraging widely on a diffuse food source is normal.

In contrast, artificial feeding results in feed being concentrated and replaced (often on the ground). A Texas study found that home range sizes of fed deer were half that of naturally foraging deer (Brown 2000). Garner (2001) in Michigan monitored over 160 radio-collared deer and observed free ranging deer at fall/winter feeding sites for two fall/winter periods (1996-1998) when baiting and feeding was allowed and one period (1999) when baiting and feeding was restricted. He reported that relative to natural conditions and regardless of the feed or feeding techniques, fall baiting and winter feeding of deer fostered higher amounts of face to face contacts among deer as well as higher local deer densities .

Long latency between CWD infection and clinical signs could cause any infection of deer at feeding sites to be spread over a broad area before symptoms were detected. This would greatly impair efforts to identify, contain and eradicate the disease (Maine DIFW 2002). An international panel reviewing CWD management in Colorado emphasized that, “Regulations preventing… feeding and baiting of cervids should be continued” (Peterson *et al.* 2002).

Ecological Effects.

There are two potential ecological effects associated with the ban on baiting and feeding: 1) it is anticipated that a smaller deer herd would result, with less overall deer browsing and secondary ecological effects, although the relationship between deer population densities and the addition of artificial food on the landscape is unclear in this state; and 2) the pattern of deer browsing would be more evenly distributed across the landscape (see preceeding Population section). Supplemental feed may have the effect of raising deer populations above levels that the natural environment will support (Ozoga and Verme 1982). Artificial feed (baiting and feeding) may increase the density of deer and may focus their browsing activity to the extent that other resources are damaged (Doenier *et al.* 1997, Waller and Alverson 1997). The proposed ban on baiting and feeding would likely have the greatest impact in northern forested environments. Populations in Wisconsin southern farmland are maintained well below maximum biological carrying capacity (KCC as defined by McCullough 1979). Thus, artificial energy from baiting and feeding may have minor effects on population dynamics and smaller effects on the environment in the southern farmland.

In 1995, the DNR prepared an environmental assessment on deer population goals and harvest management (Vander Zouwen and Warnke 1995). The environmental assessment focused on effects of alternative overwinter deer population goals and deer management unit boundaries. The assessment described known or potential ecological effects of various deer population densities.

The deer population environmental assessment concluded that different deer population densities cause different effects on other members of the communities they live in. These effects differ depending on the community type and the region of the state together with habitat carrying capacity and the severity of winter weather. Although research linking known deer population densities to specific effects on natural communities is limited, a number of probable effects of lower deer population densities can be suggested. Low deer densities can affect plant community composition. These changes may be more pronounced with deer population densities below 20-25 deer per square mile of deer habitat. Favored plant species may increase and less palatable plant species may decrease in abundance. The resulting changes in plant species composition can affect other taxa, ecological function, and productivity of an ecosystem (Bartelt and Mladenoff 1995). Many herbaceous plants can benefit from low numbers of deer (Martin 1995). Damage to plants takes the form of lost foliage, reduced reproduction, and reduced energy reserves. Tree and shrub species consumed by deer are likely to increase when overwinter deer population densities are reduced below 15-20 deer per square mile of deer habitat (Mladenoff 1995). Low levels of deer browsing on some plant species, for which some invertebrates have obligatory relationships, may affect these host-specific invertebrates (Henderson 1995). Small mammal species can benefit from low deer populations through changes in habitat structure (Edwards 1995). Low deer population densities can benefit some bird species due to changes in habitat structure, particularly the abundance of shrubs and some herbaceous plants, as well as long-term effects on forest species composition and canopy (Hoffman 1995). Bird species most likely benefiting from low deer densities are shrub-nesting species. Also, to the extent that this “artificial” energy elevates deer densities, it clearly effects the distribution and abundance of other plant and animal members in the environment (Doenier *et al.* 1997, Brown 2000).

In addition, it is not expected that turkeys would be affected from a decrease in deer densities. However, it is likely that in portions of the state that experience more severe winters, wild turkeys have benefitted from deer baiting and feeding. Turkey range is likely artificially extended northward by these practices. . . . . This range expansion may also have occurred as a result of the long period of relatively infrequent severe winters since 1987. However, it is reasonable to expect that wild turkey range may shrink southward with “normal” winters in the absence of deer baiting and feeding. Another concern relates to disease transmission amoung wild turkeys at feeding sites. In Mississippi, transmission of turkey diseases at deer feeding sites may have caused regional collapse of wild turkey population (Marshall 1999).

The anticipated deer population reductions resulting from a ban on baiting and feeding would likely reduce many of the adverse ecological effects that high deer densities may have caused during recent years. If a large proportion of hunters decide not to hunt in the future because they cannot use bait, deer harvests in the region may actually decline resulting in further growth of the deer population and subsequent greater adverse impacts on regional plant communities and dependent animal species. For a detailed discussion of the effects of a baiting ban on hunter harvest, see the preceeding section on Deer Population.

The gray wolf is the only large carnivore in Wisconsin that is heavily dependent on deer as a food source. If the deer herd in northern Wisconsin is reduced, carrying capacity for wolves in this state may also be reduced. Several other carnivore and omnivore species, like black bear, coyote, and bobcat, prey on deer fawns when available. In addition, several species of birds use road-killed deer as a source of carrion. These include common raven, American crow, turkey vulture, and the bald eagle. These species are generalists and would not be greatly affected by changing deer densities.

In addtion, the proposed ban on baiting and feeding would likely result in more evenly distribution patterns of deer browsing across the landscape by eliminating the concentration of deer around baiting and feeding sites. The hypothesis that artificial food buffers the natural environment from deer damage by providing alternate food for deer is not supported. Intuitively, it seems that the placement of feed would buffer deer browsing effects elsewhere. While this may be true in the short-term, the longer-term effects may be manifested in artificially elevated carrying capacity, higher numbers of deer, and more browsing damage everywhere. In any case, “having less damage away from feeders does not compensate for vegetation change/damage near feeders” (Tim Ginnett, Uvaldi Texas, pers. comm.).

Donier *et al.* (1997) found localized forest damage in the vicinity of artificial food sources in Minnesota. Kilpatrick and Stober (2002) found that core areas of deer activity shifted toward temporary bait sites. Brown (2000) warns of negative impacts of supplementally-fed deer on forest and range vegetation and cites a Texas study that found browsing impacts were seven times as great near feeding sites as found away from such sites.

Socio-economic Effects.

Businesses that sell bait and feed would be negatively affected by a ban on baiting and feeding. The total estimated economic impact of both baiting and feeding in Michigan exceeds $50 million (Whitcomb 1999). A similar estimate is not available for Wisconsin. But, a spokesperson for Wisconsin Corn (Bob Ohlson, WICORN, NRB meeting. Racine, June 2002) indicated that the prohibition of baiting and feeding would have the effect of forcing export from Wisconsin of three million bushels of corn annually with a profitability loss of $0.50/bu. Many small businesses (*e.g.*, Gleason, Butternut, Iron River) are highly dependent on sales of corn and other supplements to those that bait and feed deer. The latter businesses would certainly experience economic losses with any prohibition of baiting and feeding. Despite their strong economic interest in the alternative market that deer feeding provides for agricultural products (cull potatoes, carrots, apples, sugar beets, etc.), the Farm Bureaus in both Michigan (in 1999 and 2002) and Wisconsin (in 2002) have endorsed prohibitions on deer feeding. Their primary concern is protecting the health of agricultural animals from deer-borne diseases.

In accordance with Wisconsin state statutes, the DNR has considered the possible implications of these rules on small businesses, however under legislative authority, the DNR has determined that any modification to the baiting and feeding ban would undermine the effectiveness of the rule. The DNR has considered alternatives, but these alternatives would be contrary to the statutory objective of disease control and eradication.

The overall impact on tourism is expected to be minor as deer would still be plentiful and readily observed in more natural settings. Deer are one of the favorite wild animals in Wisconsin. In addition to hunting, an estimated 2.4 million people participated in wildlife watching activities in Wisconsin in 2001 contributing approximately $1.3 billion to the state's economy (IAFWA 2001). A separate estimate of economic impact specific to out-state tourists was not made. A prohibition of feeding may reduce the frequency of deer sightings as northern deer herds decrease in response to carrying capacity and as tourist establishments no longer habituate deer to food near their businesses.

There is little evidence that prohibiting baiting would result in significant reductions in license sales. The regional ban on baiting in Michigan did cause some changes in hunter effort and choice of hunting area, but there was no mention of hunters not hunting (Frawley 2002). During the 2002 Wisconsin deer seasons, there was a 19% reduction in the number of archery licenses and a 10% decrease in gun deer licenses sold. Until data from the 2002 CWD deer hunter survey is analyzed (Petchenik, in prep.), it is not certain whether this reduction was due in part to the elimination of baiting as a hunting method or whether concerns about CWD were the factors limiting license sales.

A ban on feeding of deer would likely result in a decrease in the opportunities to view deer around homes and businesses. The prohibition of deer feeding would not cause all deer to disappear from the vicinity of human housing and other developments. It may put a higher value on seeing those deer that remain. The removal of an attraction and energy source may simplify management of urban deer. A statewide prohibition on feeding would likely assist municipalities that are considering ordinances designed to mitigate urban deer problems.

A prohibition on deer feeding may add to public safety. Most rural housing is close to roads. Feeding by rural residents may have increased the risk of of car-deer crashes, especially in winter. In winter, deer withdraw to areas of thermal protection away from roads. The increase in public feeding, however, has resulted in holding deer in the vicinity of feed sources which often coincide with roadways (*e.g.*, two drivers were killed near Rhinelander as a result of residential deer feeding – Oneida County Sheriff's report 12-11-96).

One concern is that a prohibition of deer baiting would result in hunters driving deer as the primary hunting alternative with some associated trespass and safety concerns. Hunting alternatives involve a mix of strategies that have proven successful for the vast majority of Wisconsin hunters who currently hunt deer without using bait. These strategies include stalking, still hunting, and stand hunting. Most alternative strategies involve applying scouting skills and knowledge of deer behavior in order to locate areas with active deer sign.

DNR Law Enforcement reported numerous violations related to baiting and feeding (Harelson 2001). Seemingly the practice of baiting delays deer foraging until the end of shooting hours (Wegner 1993) tempting hunters to violate this hunting safety rule. Conservation wardens have found it difficult to enforce the bait quantity limit as resources are strained during the fall hunting seasons. Finally, there is a fine distinction between baiting and feeding near rural residences and cabins where there often is a light fixed on the food source. “Cabin shooting” (shooting deer from a dwelling, day or night) has become a growing illegal practice. The prohibition of baiting and feeding would eliminate any ambiguity regarding placement of foods for attracting deer and reduce cabin shooting.

There is concern for how the DNR would enforce a feeding ban with so much backyard wildlife feeding. As with any new rule, an educational effort should run parallel with enforcement. An explanation of the rule should make it clear that the rule is reasonable and necessary and would be enforced. The rule should establish a normative standard for the vast majority of well-meaning, law-abiding citizens. Peer pressure should help compliance, especially where deer are creating a hazard or are a nuisance. Enforcement of feeding restrictions in the northeast Lower Peninsula of Michigan was possible by Michigan State Police, as most feeding sites were visible from the air. Even if feed is concealed, the deer trails leading to the site were readily seen from airplanes.

Analysis of Alternatives to Ban Baiting and Feeding.

No action.

If no action were taken and a 10-gallon limit per site were to continue for baiting deer and no restrictions applied to feeding deer, the risks associated with baiting and feeding and disease transmission would not be addressed. Disease transmission risk would likely remain elevated when deer are artificially concentrated around food sources that are repeatedly replaced and become progressively more contaminated with feces, saliva, urine, and infectious material, and promote more face-to-face contacts with deer. A segment of deer hunters would be allowed to use bait, and recreational and supplemental feeding of deer would continue. Businesses that sell feed would also continue their economic activity. However, the many negative effects on the deer population, disease control, the environment, public safety, and enforcement would likely continue.

Carrying capacity for deer may remain artificially elevated in forested zones increasing transmission rates of density-dependent diseases and causing undesirable browsing impacts on the plant environment. Deer distribution may remain skewed toward areas of food supplementation confounding harvest management efforts by reducing hunter access to deer and undermining efforts to impose adequate harvest quotas. Deer behavioral patterns may be altered as normal foraging would be changed by availability of supplemented foods, timely yarding would be delayed, and localized deer damage would continue. Local communities would likely be forced to continue to promulgate feeding bans to address growing urban deer problems. Human safety may continue to be threatened by car-deer crash hazards as residents along roads continued to feed, attract, and hold deer. DNR enforcement of baiting rules such as quantity, placement, and hunting hour violations while using bait would continue.

Apply Ban to a Smaller Geographic Area.

Under this alternative, the ban would only apply to an area where the disease occurs.

Currently, the disease appears to be contained in southwestern Wisconsin. However**,** should the disease be detected elsewhere or should the disease be introduced into new areas in the future, allowing these practices to continue may provide the vehicle needed for the disease to establish itself, causing similar effects to those described under the no action alternative. If CWD is introduced into a new area of the

state, the disease may spread more rapidly if baiting and feeding were allowed than if these practices were eliminated. The DNR would likely have a better opportunity to react and eradicate the disease, if artificial concentrations of deer are prevented.

A statewide ban on baiting and feeding seems prudent because no one knows where the next disease outbreak will occur (or may have already occurred). Bovine tuberculosis has been confirmed on six captive cervid farms in east central Wisconsin. CWD has been discovered in free-ranging deer in southwestern Wisconsin and in captive deer facilities in central and southeast Wisconsin. There are about 821 captive cervid facilities throughout the state (Figure 4) that potentially could have received CWD-infected animals as there is no live-animal test for screening. In spring 2002, a captive deer escaped from a Walworth County deer farm and remained free until shot in October, at which time it was discovered that the deer was CWD positive. Considering that deer dispersal movements of up to 50 miles have been observed in studies with radio-collared deer in southeastern Minnesota (Simon 1986) it is imperative that the human-controlled activities that could lead to increased transmission be eliminated. Given our current understanding of the occurrence of CWD and its transmission, the risk factors likely occur statewide even if surveillance testing finds no wild deer with CWD.

The conditions that caused CWD to enter southwestern Wisconsin may continue to exist statewide and may continue to exist even with new surveillance and control efforts. Prohibiting baiting and feeding is important to preventing disease establishment and spread, thereby protecting the wild deer herd from CWD, bovine TB, and other significant infectious diseases (Inter-agency Health and Science Team 2002).

Baiting and Feeding License.

Recognizing the enormous recreational benefit that humans derive from baiting deer and feeding wildlife in general, some have proposed allowing baiting and feeding on private lands only by licensing. Licensing of baiting and feeding would likely allow the risks associated with disease transmission to continue. It would enable closer regulation, increase accountability, and quantify/control the extent and distribution of these activities. It would also generate revenue for conservation purposes and for enforcement and education related to baiting and feeding. It would be a means for non-consumptive users of deer and other wildlife to contribute funds toward conservation efforts. However, to the extent that baiting and feeding resumed, the practices would also likely allow all of the adverse effects of baiting and feeding to continue much the same as noted for the no action alternative above.

Quantity Restrictions.

It has been suggested that an acceptable compromise to the banning of feeding and baiting would be putting limits on the amount of food that could be fed. Amounts ranging from 2 to 6 to 10 gallons have been suggested and were considered in the analysis of this alternative to the proposed baiting and feeding ban. Quantity restrictions are unlikely to be effective in controlling the spread of disease. Garner (2001) studied this question directly, and there appear to be problems associated with both large and small feed piles. Garner (2001) reported that large piles tended to freeze during winter and he witnessed deer using the warmth from their mouths and nostrils to thaw and consume food. This behavior tended to produce semi-permanent piles of food that were “dented with burrows made from deer noses”. He suspected that a deer feeding in this manner “leaves much of its own saliva and nasal droppings in the feed pile at which it’s working”(p. 64). Thus, disease agents can contaminate large food piles. Paradoxically, restricting baiting to five gallon limits replaced daily resulted in “drastically” higher face-to-face contacts (p. 57) because of competition for feed over a smaller area when the five gallons were dumped in one pile. He reported that the five gallon restriction on food pile size was counter productive and “should be reconsidered and abandoned” (p. 53). While large bait piles can carry an increased likelihood that a diseased deer would be among those gathered, the higher rate of contacts over the smaller piles cannot be ignored in developing a disease control strategy (Garner 2001). Anecdotally, 35 different deer (multiple family groups) have been documented to repeatedly visit a two gallon feeding site in northern Wisconsin. While only a few deer might eat the entire supply, the other deer kept coming to inspect and perhaps lick the site (M. Beaufeaux, pers. comm.). Garner (2001) also documented up to 35 different deer visiting a five gallon feed pile within an hour.

Food replacement is a key issue whether dealing with 2, 6 or 10 gallons, because of the possible contamination of a feed site. Other foods whether agricultural crops or mast from a tree (*e.g.,* acorns), are not replaced until the following year or perhaps less frequently. The intent of baiting and feeding is to condition deer to repeatedly return to a specific location through the replenishment of a food source. When food is replaced in the same location, whether it is 2, 6, or 10 gallons, it focuses deer activity. Not only the food but the site itself can become contaminated with a disease agent and increase the risk of transmission of a disease such as TB or CWD.

Allowing smaller food quantities would likely not address other effects of feeding and baiting such as the cumulative energy impact on herd population dynamics, distribution, and behavior. If only two gallons of shelled corn were placed daily during the period of snow cover (~150 days), the quantity would total more than a ton. Multiply this by any reasonable estimate of residents that are feeding and the quantity becomes significant.

The infectious agent for bovine TB (*Mycobacterium bovis*) will live in a frozen condition for as long as 16 weeks outside of the animal (Whipple and Palmer 2000). The infectious agent causing CWD is believed to be more persistent than TB bacteria in the environment as the infectious agent is resistant to normal environmental degradation like UV radiation, desiccation, and temperature extremes (Brown and Gajdusek 1991). Thus, the potential for enhanced disease transmission at baiting and feeding stations is expected (Garner 2001).

Placement Restrictions.

A final alternative considered was limiting the placement (*e.g.,* number of bait-sites per acre of land, distance from roads) and methods of placing food (*e.g.,* broadcasting vs. piles). Restrictions on the placement (location) of bait and feed for deer would liekly have little effect on disease transmission rates or on herd dynamics, distribution, behavior, and manageability. The purpose of baiting and feeding, as discussed in the previous section, is to habituate deer to a location, with the intent to increase harvest and viewing opportunities. Food replacement and the resulting focused activity of deer are likely the principal mechanisms that contribute to increased disease transmission rates.

Placement concerns also relate to human safety such that feeding can attract and hold deer in proximity to roads. A recommendation from Deer 2000 that feeding not take place within a 100-yard buffer from major roads was discussed by the Natural Resources Board as being potentially inadequate to prevent car-deer collisions and not practical to enforce (Thiede 2001).

Deer 2000 recommended limiting the numbers of bait sites that hunters could maintain, but the special Natural Resources Board committee on Baiting and Feeding agreed that it would not be practical to enforce this recommendation, especially on public lands (Thiede 2001:23). The Deer 2000 recommendation was to limit hunters to three, six–gallon bait sites per 40 acres (for a discussion on quantities see the preceeding section). The DNR Bureau of Law Enforcement concurred with the Natural Resources Board committee and they reported that such a recommendation would not be practical to enforce on both public and private lands.

An additional method of feeding relating to the placement of bait/feed is the use of devices, which spread the food over an area or to spread the feed by hand. The Deer 2000 process also developed a recommendation that feed be spread over a 10-foot by 10-foot area to reduce the risk of disease transmission. This was initially used in Michigan in hope of reducing nose-to-nose contact prior to learning that TB can be transmitted on food. However, Garner (2001) reported that the use of mechanical spreaders resulted in relatively fewer face to face contacts but did not prevent contacts over supplemental food. Scattering feed also does not address the matter of environmental contamination as deer activity is still concentrated and repeated. Replacement is the mechanism for allowing substantial ingestion of food or material from the site that might be contaminated by saliva or feces. Repeated replacement may also result in the artificial concentration and habituation of deer to an area that increases potential for disease transmission by animal contact.

In addition to disease concerns, scattering feed or bait would create enforcement difficulties. The DNR Bureau of Law Enforcement has stated that it is not practical or possible to enforce a quantity regulation when the feed is scattered, because it is nearly impossible to locate or quantify the food being used under these conditions. Therefore, since the regulation is not practical to enforce, it would be very difficult to assure that illegal amounts of bait or illegal feed sites were not being used.